ORIGINAL SCIENTIFIC PAPER

Alternative technologies used in laying hens husbandry

Marius Giorgi Usturoi, Paul Corneliu Boişteanu, Razvan Mihail Radu-Rusu, Ioan Mircea Pop, Marius Gheorghe Doliş, Alexandru Usturoi

University of Agricultural Sciences and Veterinary Medicine Animal Science Faculty
Mihail Sadoveanu 8 Alley, 700490, Iasi, Romania (umg@uaiasi.ro)

Abstract

The biological material used in our researches counted 4698 “Hisex Brown” laying hybrids, randomly allocated to 5 experimental groups, meaning a control group (Lc) which comprised hens reared within standard battery cages (4 hens/cage of 2000 cm^2) and other 4 treatments: L_1exp group – hens reared in size-modified cages (6 hens/cage of 6000 cm^2); L_2exp group – hens reared in a shelter endorsed with two kinds of cages having the front panel removed (500 cm^2/hen in the nesting and resting cages and 500 cm^2/hen in the cages for feeding and water intake); L_3exp group – hens reared on shelter floor, covered with a permanent layer of minced hay (6 hens/m^2) and L_4exp group – hens accommodated within a permanent layer hall (7.5 cap/m^2) which also provided access to an external paddock. During 60 weeks of laying, the hens in control group achieved an average yield of 324.17 eggs/hen, which meant 2.83-15.87% higher than the performance of the other experimental groups and. The yield level also influenced the feed conversion ratio, which was found 7.41-35.77% better at the hens in the control group, versus those in the experimental treatments. At the end of the experiment, the body weight of the fowl belonging to the experimental groups has been found 0.23-2.66% lower than that measured at the control group, accommodated in classic cages. Flock casualties have been correlated with flock density, varying from 8.08% (Lexp-4) to 12.08% (Lc). The superintensive husbandry technology provides the best conditions of technological comfort, translated through higher performance. Although the size-modified cages and those without front panels could fulfill the poultry welfare requirements, they also decrease the production and economic performances which could be achieved per built surface unit.

Keywords: laying hens, alternative technologies, production, welfare

Introduction

Laying hens superintensive exploitation (in batteries) suppose the optimization of all technological comfort factors, in order to achieve performances as close as possible to the used hybrid potential (Gerken, 1994). Although 75% of hen flocks across the world are raised within such a system, the pressure exerted by animal protection and welfare organization on the decision factors led to the promulgation of an European Union Directive which enforces the replacement of classic battery systems with alternative technological systems, from 2012 (Michel et al, 2007; Usturoi et al, 2009b). Counting these facts and basing on certain funds granted with the Ministry of Education, Researches and Innovation, we proposed to study the productive adaptability of certain laying hybrids at the conditions provided by the alternative rearing systems (Usturoi et al, 2009a). This paper comprises the results related to dynamics of morpho-productive parameters achieved by the “Hisex Brown” laying hen hybrid, exploited in certain technological versions with vertical or horizontal disposing, which mostly cover the requirements of poultry welfare.

Material and methods

The researches have been carried out using 4698 hens belonging to "Hisex Brown" laying hen hybrid and lasted 60 weeks, between 20th - 80th weeks old. Five groups have been established, comprising a control group (L_c) and for experimental groups (L_1exp, L_2exp, L_3exp and L_4exp) (Table 1).

Table 1. Experimental design

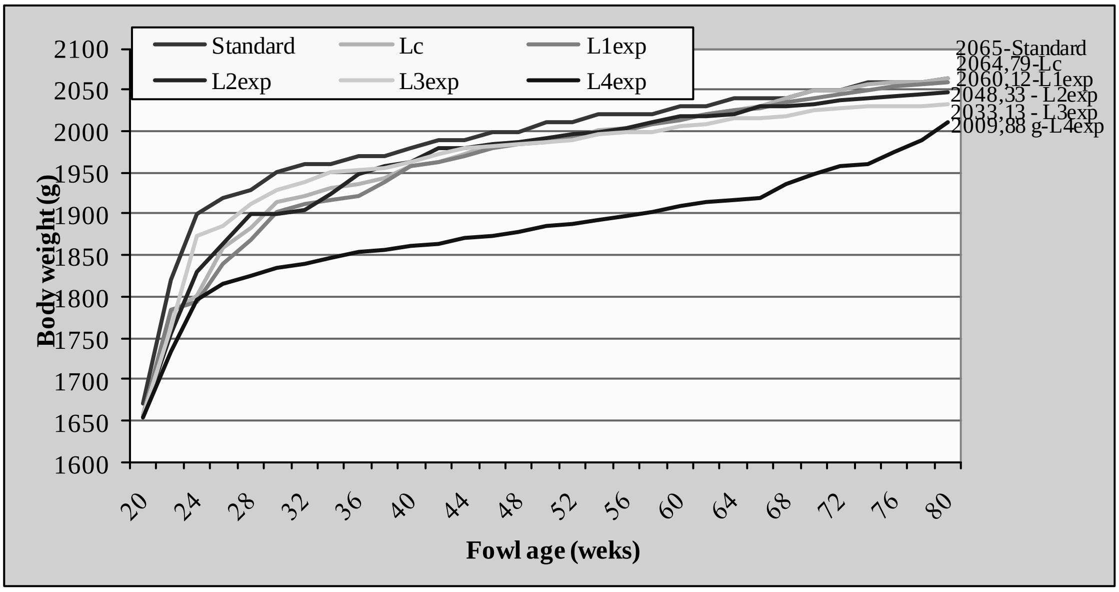
Notice	Experimental group				
	Lc	L_1exp	L_2exp	L_3exp	L_4exp
Technology Version	In battery, using classic cages	In battery, using size modified cages	In opened batteries (frontal panels removed)	On permanent litter	On permanent litter, with access to external paddock
Acco-mmodation details	*Classic cage* -surface=2000 cm^2 -size: length=0.4m; width=0.5m	*Modified cage* -surface=6000 cm^2 -size: l=1.2m; w=0.5m	*Laying and resting cages* -surface: 2000 cm^2 -size: l=1.2m; w=0.5m *Feeding and watering cages* -surface: 2000 cm^2 -size: l=1.2m; w=0.5m	*Hall* -surface: 252 m^2 -size: l=25,2m; w=10m	*Hall* -surface: 252 m^2 -size: l=25,2m; w=10m *External paddock* -surface: 3780 m^2 -size: l=60m; w=63m
Initial flock	432 cap	432 cap	432 cap	1512 cap	1890 cap
Brooding density	4 hens/cage of 2000 cm^2	6 hens/cage of 6000 cm^2	12 hens/each 2 cages of 6000 cm^2	6 hens/m^2 of hall	7.5 hens/m^2 hall 0.5 hens/m^2 paddock
Surface provided/ Hen	500 cm^2	1000 cm^2	-500 cm^2 in laying and resting cages -500 cm^2 in feeding an watering hens	0.17m^2	in hall: 0.13 m^2 in paddock: 2.0 m^2
Studied traits:			Body weight (g)		
			Eggs production • eggs yield (eggs/hen) • laying intensity (%)		
			Feed consumption • daily average intake (g/hen/day) • feed conversion ratio (g/egg)		
			Flock casualties • mortality rate (%)		

The experimental groups differed through the applied husbandry technology:

- **Lc group**=accommodation in standard battery cages (surface=2000 cm^2/cage), meaning 4 hens/cage=500 cm^2 floor/hen.
- **L_1exp group**=accommodation in size modified cages (surface = 6000 cm^2), meaning 6 hens/cage=1000 cm^2 floor/hen.
- **L_2exp group**=accommodation in opened cages (front panels removed). The cages from a battery line served as laying and resting environment, providing 500cm^2/hen, while the side battery cages served for feeding and water intake, providing also 500 cm^2/hen. The gap between battery lines was filled with permanent litter.
- **L_3exp group**= accommodation in halls with permanent litter flour, at a density of 6 hens/m^2, meaning 0.17m^2/hen. The equipments complied to standard: feeders and watering devices disposed intercalated and double leveled nests across the walls.
- **L_4exp group**=accommodation in halls with permanent litter flour, having free access to external paddock. The density reached 7.5 hens/m^2, meaning 0.13m^2/hen. Watering and feeding devices have been deployed both in hall and paddock, under a half-roof.

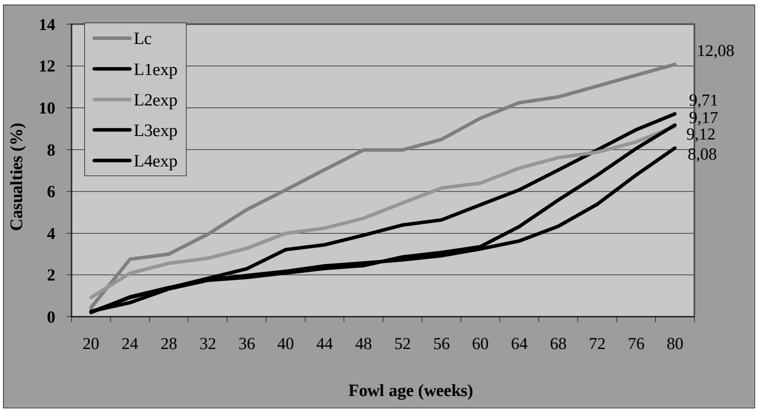
Results and discussion

1. Body weight dynamics. The technological versions used in experimental groups provided higher freedom of movement, compared to the experimental group. Although at brooding moment (20th week), fowl body weight was sensibly equal, varying between 1652.87 g-L_4exp group and 1656.51 g- L_1exp group, during the upcoming weeks differentiations occurred, due to different energy expenses. Thus, at the end of production cycle (week 80), body weight reached 2064.79 g in Lc group, 2060.12 g in L_1exp group, 2048,33 g in L_2exp group, 2033.13 g in L_3exp group and just 2009,88 g in L_4exp group (Graph 1).



Graph 1. Body weight dynamics

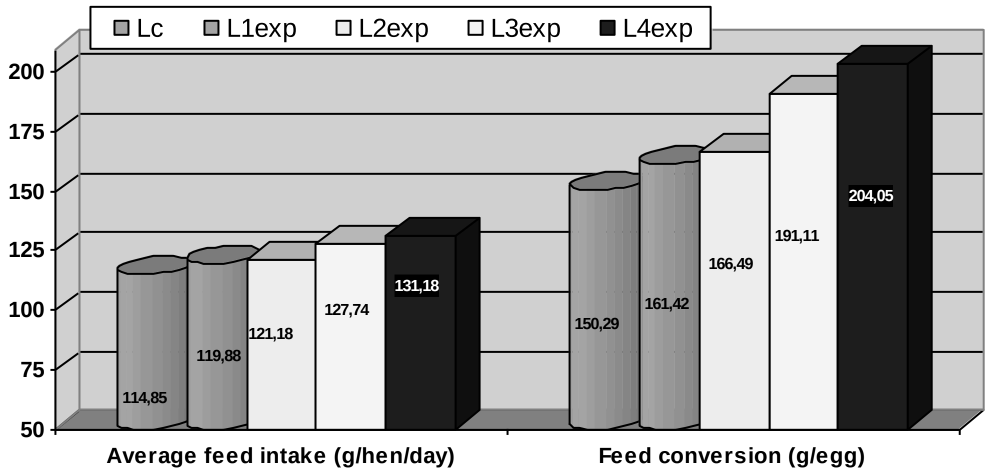
2. Flock casualties. At the end of experiment (week 80), the lowest mortality level was observed in the L_4exp – just 8.08%, as consequence of both lower pollutants concentration in hall and of beneficial influence exerted by the external environmental on hens health. Then, it increased in other groups: 9.12% in L_2exp (opened cages); 9.17% in L_3exp (permanent litter) and 9.71% in L_1exp (size modified cages). Highest casualties occurred in control group (12.08%) (highest brooding density=4 hens/cage of 2000 cm^2), knowing that the lack of isolation possibilities for aggressive hens maintained a conflict status which led to mortalities or culling (Graph 2).



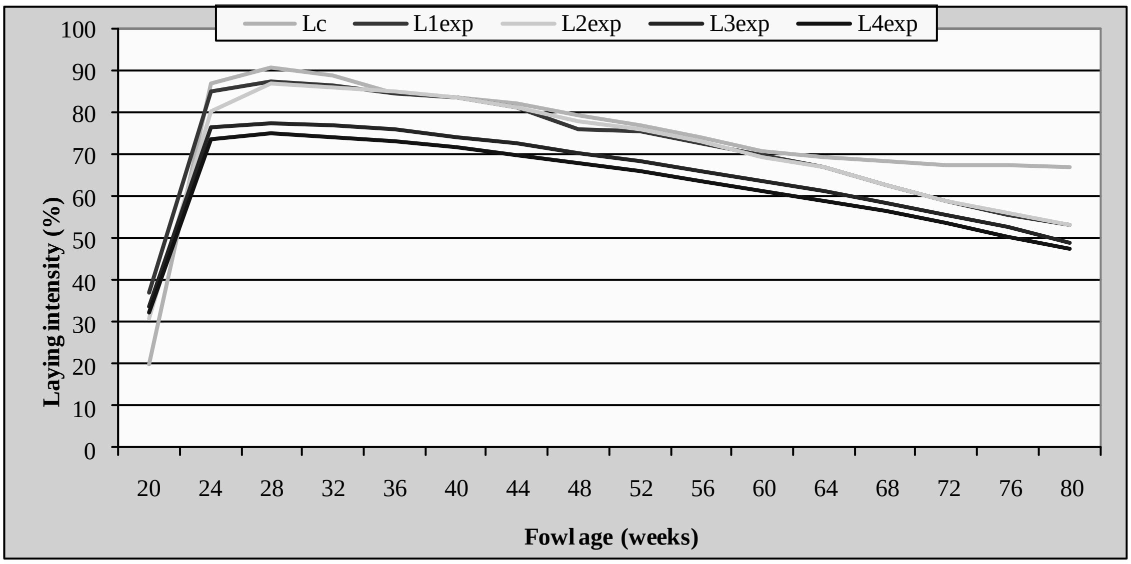
Graph 2. Flock casualties dynamics

3. Feed consumption and conversion were visible influenced by the movement possibilities we provided to the fowl and have been also correlated to achieved laying intensity (Graph 3). The best values of feed consumption across the entire period (20-80 weeks) were observed in control group (daily intake=114.85g/hen/day; feed conversion ratio=150.29g/egg), while the lowest one have been found in L_4exp group (daily intake=131.18g/hen/day; FCR =204,05g/egg).

4. Laying intensity and eggs yield. Highest production intensity was reached when fowl turned 28 weeks old, reaching 90.9% in control group and lower levels (74.98-88.28%) in experimental groups (Graph 4).



Graph 3. Parameters related to feed consumption



Graph 4. Laying curve

The classic exploitation technology allowed a production level of 324.17 eggs/hen then lower performances were achieved by other studied versions: L_1exp (size modified cages) – 314.98 eggs/hen; L_2exp (opened cages) – 313.54 eggs/hen; L_3exp (permanent litter)-282.54 eggs/hen and L_4exp (permanent litter and access to external paddock) – just 272.72 eggs/hen.

Conclusion

Among the technological versions we used, only the classic version (control group) allowed the maintenance of fowl weight close to the standard development curve, while higher freedom movement in experimental groups induced 0.23-2.66% decreases in final body weight.

Flock casualties dynamics had the highest level in the control group, due to higher brooding density level, meaning 2.37-4.0% more casualties than the experimental groups.

Concerning the laid eggs amount, only the hens in the control group approached the theoretical performance of hybrid. In experimental groups, the husbandry factors induced decreases of eggs yield, meaning 2.83-15.87% less than control. The yield was correlated with laying intensity, whose average values reached 57.14% in control group, respectively 48.06-54.74% in experimental groups.

Better performances for feed consumptions have been achieved by the hens in the Lc group (classic cages), which meant average intake of 114.85 g/hen/day and FCR value of 150.29 g feed/egg. At the other hens, daily feed intake was 4.38-14.21% higher, and also FCR values (7.41-35.77% over control).

The superintensive hens exploitation, using classic battery cages, allows the achievement of performance values very close to the hybrid potential, under better conditions for production room usage. The other technological version fulfils the welfare requirements but give poorer results and lead to economic looses per surface unit. Moreover, these alternative systems have a high degree of risk in the occurrence of certain diseases.

Acknowledgement

The results presented in the paper are an output from research projects PNCDI II 681/2007-2010, IDEI, granted by the Romanian National Council of Scientific Research in Higher Education (CNCSIS-UEFISCSU).

References

Gerken, M. (1994). Evaluation of alternative housing systems for layers. Archiv für Geflügelkunde, 58: 197-206.

Michel, V., Arnould, C., Mirabito, L. and Guemene, D. (2007). Housing systems and welfare in laying hens, INRA Prod. Anim., 20 (1): 47-52.

Usturoi, M.G., Boişteanu, P.C., Radu-Rusu, R.M., Pop I.M., Doliş, M.G. and Usturoi A. (2009a). Alternative technologies applied in laying hybrids husbandry. World´s Poultry Science Journal. 8th European Symposium on Poultry Welfare. Book of Abstracts, pg. 33. Cervia, Italy, 18-22 May 2009.

Usturoi, M.G., Boişteanu, P.C., Radu-Rusu, R.M., Pop I.M., Doliş, M.G. and Usturoi A., (2009b). Productivity of the laying hybrids reared in different husbandry systems. Book of Abstracts of the 60th Annual Meeting of the European Association for Animal Production, Wageningen Academic Publishers, The Netherlands. p. 328.